

# **Trans-Boundary Monitoring Plan**

## **Estevan, SK – Burke County, ND**

Canada and the United States are committed to addressing shared concerns regarding transboundary air pollution under the 1991 Canada-US Air Quality Agreement. One of the provisions of the Agreement allows for bi-national consultation when one Party considers that there is transboundary air pollution coming from the territory of the other Party. In 1997, the United States requested that bi-national discussions of the Boundary Dam Power Station be undertaken.

While the immediate goal of the bi-national consultation is to provide a way to respond to a concern regarding possible transboundary air pollution, an important benefit of the process is the binational working level relationship that the process engenders. A consistent theme of the bi-national consultation process is that people matter. People of both countries, working together, will provide the focus to keep the process moving forward, investigate the problems of concern and identify potential solutions. Part of the process that is used to guide the bi-national consultation includes joint ambient air monitoring.

An air quality monitoring network will be set up in the Estevan area of Saskatchewan and Burke County, North Dakota to characterise the transboundary flow of particulate matter (PM) and precursor gases and monitor changes in the air quality over time. The network will consist of at least five sites jointly operated by Saskatchewan Environment and Resource Management (SERM), SaskPower, Saskatchewan Water Corporation and the North Dakota Department of Health (NDDH).

### **Background**

Since 1975, the North Dakota Department of Health has received complaints about poor air quality in several communities in Burke County. These complaints have been specific to particles reducing visibility and causing property damage. In recent years, there has been an increase in health related complaints in both the Estevan area and Burke County. The Boundary Dam Power Station (BDPS) is perceived to be the major source of these particles, because of its prominence in the area. SaskPower is installing electrostatic precipitators (ESPs) on the stacks at the power station over the next five years, with the first one beginning to operate in October 1999. There are however, other emission sources in the area that may be contributing to the health effects and triggering the complaints.

### **Study Area**

The primary study area is the area within 20 km of Estevan and down wind, southeast of Estevan, 60 km. The combined population in the area is approximately 13,000 people. Within this area are two major power plants, a coal carbonising plant, a coal mine, oil and gas production, agricultural activities, grid roads, heavy-duty diesel vehicles, and flaring in the North Dakota and Saskatchewan oil fields. Sources in North Dakota that may have an impact in the area are the coal conversion facilities in Mercer, Oliver, and McLean Counties and the gas processing plants in the northwestern part of the state. Other major sources in Montana may have some impact in the transboundary monitoring area.

## Monitoring Goals

In order to meet our primary objective, to characterise transboundary flows, measurements of particle mass, precursor gases and meteorology at representative locations in the area are needed. Secondary goals include the following: i) developing a quality assurance project plan, with colocated samplers, to ensure that consistent and comparable data are obtained, and ii) establishing a common data reporting format that can be accessed by the various users. As a result of installation of ESPs on the power station, the monitoring network will capture changes in air quality before and after the installation of this control technology. The data, therefore, will have a number of uses: characterising transboundary flows, establishing current conditions, characterising before and after air pollution concentrations, and conducting health effects studies.

## Network Overview

The monitoring network will focus on ambient air pollutants:  $PM_{2.5}$ , sulfur dioxide ( $SO_2$ ), nitrogen oxides ( $NO_x$ ), and meteorology (wind speed, wind direction, and temperature). Because long term data are not available from all network stations, the first year of data will be used to establish baseline concentrations. Five monitoring sites will be used in the ambient monitoring network. Sites at Estevan, BDPS, and the Short Creek Wildlife Management Area (hereafter referred to as Short Creek), are already operational. Table 1 identifies the sites and operating agencies, the parameters being measured, start-up dates and sampling frequency.

The Estevan site will be expanded to include colocated continuous and manual  $PM_{2.5}$  samplers (Table 2). Environment Canada is providing a continuous  $PM_{2.5}$  analyser (R&P TEOM) to be colocated with a single-day  $PM_{2.5}$  sampler (Thermo Environmental Inc. Federal Reference Method or FRM sampler) provided by the US Environmental Protection Agency (EPA). Collocating the samplers will provide information on comparability between FRMs and TEOMs, and allow the establishment of correction factors to enable a seamless Canada-US data set.

New sites will be set up at Rafferty Dam in Saskatchewan, and Lignite in Burke County. The US EPA is providing two additional Thermo Environmental Inc. single-day  $PM_{2.5}$  samplers to NDDH for use at these sites (Table 2). The data collected will be used to establish fine particle levels within the monitoring area.

The first year of data from the continuous  $SO_2$  and  $NO_2$  analysers at Estevan, BDPS and Short Creek will establish baseline ambient concentration data for the gases.

The US EPA/US Fish and Wildlife Service is installing an IMPROVE sampler in the Lostwood National Wildlife Refuge, 55 km south-southeast of Estevan, scheduled for a January 1, 2000, startup. Speciation data collected at this site will enable source apportionnement modelling to occur in the future. Additional data will also be available from the prairie background site once it is moved from Esther to Bratt's Lake, southeast of Regina. Acid rain, ground-level ozone,  $PM_{10}$ ,  $PM_{2.5}$ , and radiation sampling will occur at this site. Data collected at this site will be used to supplement the data collected by the five primary sites.

Table 1 Estevan-Burke County Trans-Boundary Monitoring Network Sites					
Site	Location	Operating Agency	Parameters	Start Date	Operating Schedule
Boundary Dam Power Station	Saskatchewan, 1 km southeast of the Power Station, 5 km south-southwest of Estevan	SaskPower	SO <sub>2</sub>	spring 99	Continuous
			NO <sub>2</sub>	spring 99	Continuous
			PM <sub>2.5</sub> FRM	Nov 98	1/6 day
			PM <sub>10</sub> FRM	Nov 98	1/6 day
			TSP	Nov 98	1/6 day
Estevan	Saskatchewan	SaskPower	WS, WD, Temp	Nov 98	Continuous
			SO <sub>2</sub>	1 Aug 92	Continuous
Short Creek	Burke County, ND, 11 km north of Columbus, 23 km southeast of Estevan	NDDH	NO <sub>2</sub>	1 Aug 92	Continuous
			SO <sub>2</sub>	1 Mar 99	Continuous
			NO <sub>2</sub>	1 Mar 99	Continuous
			PM <sub>2.5</sub> FRM	13 Dec 98	1/6 day
			PM10 FRM	8 Sep 98	1/6 day
			WS,WD,Temp	1 Mar 98	Continuous

Table 2 New Measurement Parameters at Existing and New Sites					
Site	Location	Operating Agency	Parameters	Planned Start Date	Operating Schedule
Estevan	Saskatchewan	SaskPower	PM <sub>2.5</sub> TEOM	November 99	Continuous
			PM <sub>2.5</sub> FRM		
Lignite	Burke County, ND, 43 km southeast of Estevan	NDDH	PM <sub>2.5</sub> FRM	July-August 99	1/6 day
Rafferty Dam	Saskatchewan, 10 km west of Estevan	Saskatchewan Water Corporation	PM <sub>2.5</sub> FRM	November 99	1/6 day

The various operating agencies will work together to ensure the data collected meets at least the minimum data quality described in the Trans-Boundary Monitoring Plan's Quality Assurance Project Plan.

## **Quality Assurance Project Plan**

A quality assurance project plan (QAPP) will be in place for the duration of the monitoring project to ensure that the data produced are of acceptable precision, accuracy, completeness, representativeness, and comparability. The QAPP is being developed by, and will be approved by: SaskPower, SERM, NDDH, and the US EPA Region 8. It is based on the Model Quality Assurance Project Plan for PM<sub>2.5</sub> Ambient Air Monitoring Program for State and Local Air Monitoring Stations (EPA-454/R-98-005, April 1998). Several components of the plan are expanded upon below, including measurement methods, analysis, and data management.

### **Operations**

The operating agencies are each responsible for sample collection, site operation and maintenance. Cost estimates, in US dollars, are provided in the QAPP.

SERM will train the TEOM operators at the Estevan site during installation while NDDH will provide training for the PM<sub>2.5</sub> FRM operators at each site.

### **Measurement Methods and Analysis**

Twenty-four hour PM<sub>2.5</sub> concentrations will be determined using gravimetric analysis in accordance with 40 CFR Parts 50 and 58 US Code of Federal Regulations and Quality Assurance Guidance Document 2.12, Monitoring PM<sub>2.5</sub> in Ambient Air Using Designated Reference or Class I Equivalent Methods. All particle filters will be shipped, by the site operating agency, to North Dakota for gross mass weighing. NDDH will then store the filters for potential speciation analysis at some time in the future.

Continuous SO<sub>2</sub> and NO<sub>x</sub> data will be collected in accordance with 40 CFR Parts 50 and 58. The party operating the analyser is responsible for validation of the data and will determine the specific method used.

Meteorological data will be collected to supplement the particle and gas data. Parameters collected will be wind speed, wind direction, standard deviation of wind direction, and ambient temperature.

### **Quality Control**

Local agencies will maintain the samplers according to each agency's operating procedures. System-wide audits will be performed by NDDH and SERM as outlined in the QAPP; each agency will cover their respective costs.

### **Data Management**

Once the particle filters have been weighed and verified, Canadian data will be submitted to the NATChem database while data from North Dakota will be submitted to the AIRS database. The raw gaseous and meteorology data is provided to either SERM or NDDH, and subsequently submitted to the respective national database. To the extent possible, NDDH will submit all data to AIRS.

## **Roles and Responsibilities**

Quality assurance and quality control activities will be shared jointly with all parties.

Annual reports will be prepared jointly, beginning in the year 2000, summarising the concentrations of all monitored pollutants in the transboundary network. This summary will include descriptive statistics such as mean, median, 90<sup>th</sup> percentile, and identify any exceedences of each countries respective air quality standards. In addition, the report will evaluate the effect of meteorology on particle concentrations.

The network will operate for five years, after which the air monitoring workgroup will make a recommendation to the partners concerning future monitoring needs in the area.

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